REMARKS

Applicants acknowledge the Examiner's comments regarding the pendency of Claims 1-11 in this application, being those claims which were appended to the International Preliminary Examination Report, which issued prior to the filing of the U.S. National Stage application. Accordingly, Applicants further acknowledge that the initial examination of this application has proceeded on the basis of Claims 1 through 11, referred to previously. By the foregoing amendment, Claims 1-11 have been cancelled, and new Claims 12-25 substituted in place thereof.

In response to the objection to the Abstract of the Disclosure, Applicants have submitted a new Abstract, which is believed to comply with all regulatory requirements. As required, the Abstract is attached hereto on a separate page.

The objection to Claims 4-11, as set forth in paragraph 4 of the Office Action, has been rendered moot by the cancellation of Claims 1-11, and the submission of new Claims 12-25 as previously mentioned.

Claims 1 and 2 have been rejected under 35 U.S.C. §103(a) as unpatentable over Schoenwald et al (U.S. Patent No. 5,757,994), while Claim 3 has been rejected as unpatentable over Schoenwald et al in view of Kapany et al (U.S. Patent No. 4,993,796). (Claims 4-11 were not considered on the merits.) For the reasons set forth hereinafter, Applicants respectfully submit that new

Claims 12 through 25 distinguish over the cited Schoenwald et al and Kapany et al references, whether considered separately or in combination. The present invention is directed to a structure for providing an external coupling to optical fibers which have been embedded within a composite material, such as is used to form structural components of aircraft. The use of such optical fibers embedded within the composite material of which the aircraft components themselves are manufactured has proven to be particularly advantageous for a variety of reasons, including reduced weight, elimination of electromagnetic interference problems, lower raw material costs and elimination of potentially dangerous conductive paths.

On the other hand, the embedding of optical communications fibers within the structural materials themselves has given rise to a problem of being able to effectively couple the fiber optics communication cable within the structural material to external light transmission means located outside the material.

The present invention provides an improved arrangement for coupling a first optical transmission medium, such as an optical fiber embedded within a composite, to an external optical fiber. For this purpose, the optical fiber is embedded within a layer of composite material, together with an optical processing means which is secured and optically coupled to the optical fiber for processing light to and from the optical fiber. The optical processing means also

includes an interface surface which provides a means for optical coupling to the optical fiber from a point outside the composite material.

In one embodiment of the invention, depicted in Figure 6A and 6B of the drawing, the optical processing means is formed on a micro-substrate 92 that is also embedded within the composite material 94. This arrangement has two purposes. First, it enables the optical processing means (micro-optical component 90 in Figures 6A and 6B) and the optical fiber 96 to be aligned and secured together with high precision on the micro-substrate 92. In addition, it also facilitates the coupling of the optical processing means and the embedded optical fiber to an external connector, accurately and reliably. Thus, the use of the micro-substrate 92 facilitates and simplifies the manufacturing process.

The Schoenwald et al reference, on the other hand, discloses an optical T-coupler which is said to be of simple design, easily manufactured and easily applied. As depicted, for example, in Figure 1, such a T-coupler includes first, second and third port assemblies 12, 14, 16 as well as a light deflecting element assembly, which includes two deflecting elements 28 and 30. This arrangement permits light introduced into one of the first and second light ports 12,14, to be split between the other of the first and second light ports 12,14, and the third light port 16. The first port assembly 12 includes a ferrule 20 for aligning the fiber optic cable 22 and positioning it with respect to a lens 24. The structure and functioning of the optical coupler in Schoenwald et al is described succinctly

in the specification at Column 2, line 50 through Column 3, line 10. (See also, Figure 3, and Column 5, lines 21-25.)

From the foregoing description, it is apparent that the Schoenwald et al reference differs fundamentally from the present invention. In particular, it does not include an optical transmission means embedded within a layer of composite material, as recited in independent Claims 12 and 20, nor does it disclose a structural component comprising a layer of composite material forming a structural component in a desired configuration, with an optical transmission medium embedded within the layer of composite material, as recited in Claim 25.

Moreover, each of the independent claims of this application also recites that the composite also comprises a micro-substrate embedded within the composite material, on which an optical processing means is provided and secured to the optical transmission means. Claim 12, for example, further recites that the optical processing means, thus mounted on the micro-substrate and embedded within a composite material, is optically connected to the optical transmission means for processing light to and from the optical transmission means and for providing an optical interface surface, for optical connection to the transmission means from outside the composite material.

In addition to the foregoing, Claims 15, 18 and 22 further recite that access to the transmission means within the composite material is provided via a

passageway formed within the composite material, and that furthermore, means provided for preventing laser irradiation light to form the passageway from being optically coupled with the transmission means, by differentiation between the wavelengths of laser light used to form the passageway and the light used for optical signaling purposes within the transmission means. This feature of the invention is also neither taught nor suggested by the cited references.

Moreover, Claims 18, 20 and 21 further recite the provision of locating means for locating the position of the high quality optical interface surface from a point external to the carrier, which locating means comprise a detectable position marker embedded within the composite material itself. Finally, Claims 18, 20 and 22 further recite a depth marker embedded within the composite material, which indicates when the passageway has been formed to a correct depth for providing access to the transmission means. The latter features are also neither taught nor suggested by Schoenwald et al.

The Kapany et al reference, on the other hand, has been cited as teaching the use of an opaque plug to close off the end of a housing 21 within which optical fibers 14 and 15 communicate with a transparent imaging element 20, when the monitoring unit 16 (Figure 1) is not required. Accordingly, it is apparent that Kapany et al also fails to teach or suggest the limitations referred to above, in Claims 12 through 25.

In light of the foregoing remarks, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #2101/50769).

Respectfully submitted,

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Attachment – Abstract of the Disclosure

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